INFRARED SPECTROSCOPY OF THE H_2/HD/D_2-O_2 VAN DER WAALS COMPLEXES

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Hydrogen is the most abundant element in the universe and oxygen is the third, so understanding the interaction between the two in their different forms is important to understanding astrochemical processes. The interaction between H_2 and O_2 has been explored in low energy scattering experiments[a,b] and by far infrared synchrotron spectroscopy of the van der Waals complex[c]. The far infrared spectra suggest a parallel stacked average structure with seven bound rotationally excited states. Here, we present the far infrared spectrum of HD/D_2-O_2 and the mid infrared spectrum of H_2-O_2 at 80 K, recorded at the infrared beamline facility of the Australian Synchrotron. We observed 'sharp' peaks in the mid infrared region, corresponding to the end over end rotation of H_2-O_2, that are comparatively noisier than analogous peaks in the far infrared where the synchrotron light is brightest. The larger reduced mass of HD and D_2 compared to H_2 is expected to result in more rotational bound states and narrower bands. The latest results in our ongoing efforts to explore this system will be presented.

[a] Y. Kalugina, et al., Phys. Chem. Chem. Phys. 14, 16458 (2012)
[b] S. Chefdeville et al. Science 341, 1094 (2013)
[c] H. Bunn et al. ApJ 799, 65 (2015)